Support Tables

A-1 *Effective Lives (Years)*

Class	Asset Type	Exp Life
1	Civil	75
2	Pressure Pipework	60
3	Sewers	100
4	Pumps	40
5	Valves	30
6	Motors	35
7	Electrical	35
8	Controls	25
9	Building Assets	60
10	Land	300

A-2 *Condition Assessment*

Physical Condition Grade – Rating Guidelines	
1 Excellent	Asset is like new, fully operable, well maintained, and performs consistently at or above current standards. Little wear shown and no further action required.
3 Good	Asset is sound and well maintained but may be showing some signs of wear. Delivering full efficiency with little or no performance deterioration. Virtually all maintenance is planned preventive in nature. At worst, only minor repair might be needed in the near term.
5 Moderate	Asset is functionally sound, showing normal signs of wear relative to use and age. May have minor failures or diminished efficiency and some performance deterioration. Likely showing modest increased maintenance and/or operations costs. Minor to moderate refurbishment may be needed in the near term.
7 Poor	Asset functions but requires a sustained high level of maintenance to remain operational. Shows substantial wear and is likely to cause significant performance deterioration in the near term. Near term scheduled rehabilitation or replacement needed.
9 Very Poor	Very near end of physical life. Substantial on-going maintenance with short, recurrent maintenance intervals required to keep the asset operational. Unplanned corrective maintenance is common. Renewal (refurbishment or replacement) is expected in near term.
10 Failing	Effective life exceeded and/ or excessive maintenance cost incurred. A high risk of breakdown or imminent failure with serious impact on performance. No additional life expectancy; immediate replacement or rehabilitation needed.

A-3 *Performance*

Performance Rating	Description
1	Exceeds / Meets all Performance Targets
2	Minor Performance Deficiencies
3	Considerable Performance Deficiencies
4	Major Performance Deficiencies
5	Does not meet any Performance Targets

A-4 *Reliability*

Reliability Rating	Description	Failure Timing
1	As Specified by Manufacturer	Never
2	Random Breakdown	Every 20 Years
3	Occasional Breakdown	Every 5 Years
4	Periodic Breakdown	Every 2 Years
5	Continuous Breakdown	= 1 year

B-1 Design Life Adjustment Factors

	IMPACT RATING FACTORS				
Factor	**1**	**2**	**3**	**4**	**5**
DESIGN STANDARDS	10%	5%	0%	-5%	-10%
CONSTRUCTION QUALITY	10%	5%	0%	-5%	-10%
MATERIAL QUALITY	10%	5%	0%	-5%	-10%
OPERATIONAL HISTORY	10%	5%	0%	-5%	-10%
MAINTENANCE HISTORY	10%	5%	0%	-5%	-10%
OPERATING ENVIRONMENT	10%	5%	0%	-5%	-10%
EXTERNAL STRESSES	10%	5%	0%	-5%	-10%

C-1 Consequence of Failure

Consequence of Failure - Wastewater						
Social/community/ organizational						
Loss of Service - Impact	Can be out of service indefinitely	Cannot be down a month	Cannot be down a week	Cannot be down 1 day	Cannot be down 8 hours	Cannot be down 1 hour
Safety	No impact	Minor inconvenience	Minor injury	Moderate injury and some sickness	Major injury, sickness, some death	Subsrtantial death, widespread injury and sickness
Agency **Image**	No media or no consequence	Neutral coverage	Adverse media	Widely adverse media	Continual; political opposition	National adverse media
Economic/Financial						
Economics, Hassle Factor	Low cost & low hassle	Low cost & high hassle	High cost; low hassle	High cost, high hassle & diverts $	Painful change of priorities	Likely trigger rate Increase; staff changes
Environmental						
Spill, Flood, Odor	Short duration, sm. qty. onsite: no complaints	Backups; small no. of complaints	Aggressive complaints and liability	Substantial liability, many impacted	Has not appened at this scale before	Sustained, lg. qty., offsite, many complaints
Process & Effluent Quality	No impact: SS; BOD; MPN; Cake	Routine adjustment	Significant corrective action	Significant adj. with uncertainty	Major process recovery with lag time and uncertainty	Loss of process control
Permit compliance	No consequence	Violated daily standard	Violated weekly standard	Violated Monthly Standard	Damage reversible in six months	Permit jeopardized; damage reversible in 5 yrs or more
Score	**1**	**3**	**5**	**7**	**9**	**10**

D-1 Probability of Failure

% of Effective Life Consumed	PoF Rating
0%	**1**
10%	**2**
20%	**3**
30%	**4**
40%	**5**
50%	**6**
60%	**7**
70%	**8**
80%	**9**
90%	**10**

D-2 Don't Forget Risk mitigation/Redundancy

Level of Redundancy	Reduce PoF by:
50% Backup	50%
100% Backup	90%
200% Secondary Backup	98%

Alt D-1

Element	Description					
SCORE	1	3	5	7	9	10
Technical Performance	Substantially exceeds current requirements	Exceeds current requirements	Meets current requirements but with room for improvement	Obvious concerns: cost/benefit questions	Inefficient; becoming ineffective, obsolete	Failing, not capable of sustaining required performance
Operational Performance	Negligible attention required	Exceeds current requirements	Meets current requirements but with room for improvement	Obvious concerns: cost/benefit questions	Difficult to sustain performance	Failing, not capable of sustaining required performance
Reliability	As specified by manufacturer	Infrequent breakdown	Occasional breakdown	Periodic breakdown	Continuous recurrent breakdown	Virtually inoperable
Availability	Virtually always operational	Out of service only for very short periods	Out of service for moderate period; moderately difficult to return to service	Increasingly difficult to return to service; parts becoming a challenge	Extensive downtime duration; difficult to return to service; parts, difficult to acquire, rare skills required	Virtually impossible to return to service; parts no longer available; unavailable trained personnel
Maintainability	Easily maintained; OEM maintenance is straightforward	Largely preventive maintenance with some corrective maintenance beginning to show up; baseline monitoring	Increasing minor maintenance required; periodic corrective maintenance including some repair shortening of monitoring intervals	Scheduled maintenance becoming frequent; more experienced trades people required for maintenance; frequency of work orders increasing substantially with short monitoring intervals	Work orders well above average for type of asset; recurrent minor repair; close monitoring required; most senior people required to sustain performance	Maintenance is frequent with recurrent patterns of failure; asset must be virtually constantly monitored to sustain performance
% Physical life consumed	Almost new; up to 10% physical life consumed	Up to 30% physical life consumed	Up to 50% physical life consumed	Up to 70% physical life consumed	Up to 90% physical life consumed	Virtually consumed, imminent failure
CONDITION SCORE	1	3	5	7	9	10
Prob of Failure	**0.1**	**0.3**	**0.5**	**0.7**	**0.9**	**0.99**

E-1 Renewal Strategies

1 Status quo
2 Increase Maintenance
3 Operate differently
4 Repair only
5 Refurbish or rehabilitate
6 Replace with similar asset
7 Replace with improved asset
8 Reduce the cause of failure
9 Use demand management
10. Reduce the level of service
11 Construct a new asset